

REMARKS

Review and reconsideration of the application in view of Applicants' amendments and remarks are respectfully requested. Claims 16-25, 27-39, 54-62 and 64-86 remain in the present application. Applicants have amended Claims 16 and 54.

The Examiner has objected to the Amendment filed on Nov. 15, 2006 because it introduces new matter. Specifically, the Examiner states the originally filed specification does not provide antecedent basis for the thickness of the condensed reaction product. Applicants have amended page 11, paragraph 1 to state "Overcoats or the first charge transport layer comprising the silsequioxanes or the condensed reaction product of the charge transport polymer of Formula 1 below of the invention desirably has a thickness." It is believed that this amendment overcomes the objection to the specification. In addition, Applicants have amended page 11, paragraph 1 to remove the reference to the condensed reaction product having a thickness of 40 microns. It is believed that these amendments to the specification overcome the objections to the specification under reference numeral 6 and reference numeral 7 (2) in the Office Action.

The disclosure has been objected to for certain informalities. Applicants have gone through the specification and amended various places to capitalize trademarks whenever they are used. It is believed these amendments to the specification overcome the objections under reference numeral 7 (1) of the Office Action.

Under reference numeral 8 of the Office Action, the specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. Specifically the Examiner objects to amended paragraph 1 on page 11 in the amendment filed November 15, 2006. Applicants have amended paragraph 1, page 11 to state that the silsequioxane or the charge transport layer can have a thickness of up to 40 microns. It is believed that this overcomes this rejection and that claims 84-86 have antecedent basis in the specification.

Claims 16-32 and 54-86 have been rejected under 35 USC 112. The Examiner takes issue with claim 16 and those dependent thereon with the recitation that the colloidal silica is based on the weight of the charge transport polymer. Applicants have amended claim 16 to state that the silica weight is based on the weight of the silsesquioxane. Applicants have amended claim 54 to state the charge

transport material comprises a silsesquioxane of the condensed reaction product of the cited formula. Support for this amendment is found in the specification as originally filed, specifically the formula cited on page 5 and 11 of the specification. In addition claim 54 has been amended to state that the silica weight is based on the weight of the silsesquioxane.

Claims 54, 55, 59-62, 64-73, 75-80 and 83-86 have been rejected under 35 USC § 102(e) as anticipated by or, in the alternative 35 USC § 103(a) as being obvious over US 6,495,300 B1 (Qi), as evidenced by US 5,930,090(sic) (Beaurline) (Applicants believe this should be US 5,939,090) and US 4,082,710 (Vrancken). Applicants respectfully traverse this rejection.

The Examiner points to formula IV-a of Qi stating that it comprises 0.02 mole fraction of the monomer 3-(trimethoxysilyl)propylmethacrylate and 0.10 mole fraction of the monomer comprising a hole transporting moiety, vinyl carbazole. This statement by the Examiner although correct, does not anticipate Formula 1 of the present invention. The present invention requires a tertiary arylamine charge transport moiety (reference A) and a divalent bridging moiety (reference X). This structure is not shown, suggested or taught in Qi. Qi uses as a charge transport moiety 9-vinyl carbazole which is not a triarylamine. The nitrogen is bonded directly to the vinyl group. This is very different from any of the tertiary arylamines described by Applicants. All the structures of Applicants invention clearly show the monomer has a phenyl group bonded to the vinyl moiety in a styrenic fashion. The Examiner's statement that the layer structure meets the structure limitation recited in claim 54 is not supported. There is no divalent bridging moiety shown in Qi. Therefore this reference cannot anticipate the present invention as all the claimed elements are not shown in the reference and this rejection must be withdrawn. The citations of Vrancken and Beaurline do nothing to correct the deficiency of this rejection as they are used to show silica particles associated with the tradename AEROSIL[®] 200 are colloidal silica. Although both Vrancken and Beaurline state that AEROSIL[®] 200 is colloidal silica, their statements are not consistent with the technical description published by Degussa AG, the manufacturer of AEROSIL[®] silica. Applicants have provided the following reference "**Technical Bulletin Fine Particles Number 11, Basic Characteristics of AEROSIL[®] Fumed Silica**", available at Degussa.com. This reference states: "AEROSIL[®] is the trade-mark owned by Degussa AG with 106

registration in 84 countries throughout the world for a fumed, highly dispersed, amorphous, pulverulent synthetic silica. The particle fineness and structure of the AEROSIL[®] fumed silica primary particles are reflected in the application characteristics.” The Degussa bulletin clearly indicates all AEROSIL[®] silicas, including AEROSIL[®] 200, are fumed silicas. It is well-known that fumed silica is technically different from colloidal silica, as discussed in *The Chemistry of Silica* by Ralph K. Iler (from DuPont), Wiley-Interscience Publication, John Wiley & Sons, New York, 1979 (p 331 and 337), a copy is also provided.

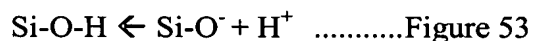
Applicants have amended independent claims 54 to require from 5 to 30 percent basic surface charge colloidal silica. Support for this amendment is found on page 24 line 27 and the surrounding paragraph of the specification wherein it is described that the silanol from the colloidal silica remains to act as a basic condensation catalyst for the formation of the silsesquioxane.

The Examiner has dismissed the previous argument that the fumed silica used in Qi is not colloidal silica. The Qi silica (AEROSIL[®] OX50, 130, 150, 200, 300, 380) (Qi, US 6,495,300 B1, col 16, lines 62-67) materials have completely different chemistries and properties. AEROSILS[®] are made by pyrolysis of silanes, leading to surfaces that are covered with silanol groups. AEROSILS[®] is a trademark of the manufacturer Degussa. They are highly acidic and will catalyze acid sol-gel chemistry. They are not soluble in water or solvents. As indicated in Qi, col 15, lines 47, the particles must be dispersed into the polymer by ball milling. Ball milling is used to disperse insoluble pigments into organic polymers, and an organic base is always present to help disperse the silica. This is discussed in *The Chemistry of Silica* by Ralph K. Iler (from DuPont), Wiley-Interscience Publication, John Wiley & Sons, New York, 1979 on page 337 in the second paragraph. “In general, the “fume” or “flame hydrolysis” process does not yield silica that is dispersible in water to give sols of discrete particles with the low viscosity at high concentration that is characteristic of sols made by aqueous polymerization processes. Nevertheless, with enough processing, pyrogenic silica of ultimate particle size of 10-25 nm can be disaggregated and dispersed to aquasols containing up to 40 % silica with suitable mechanical treatment and dispersing agents.” This would describe the milling process that Qi uses to disperse the AEROSIL[®] in the polymer solution. The mechanical process of using an acidic silica to make a colloidal suspension of silica is employed

in the patents by Vrancken and Beaurline. Beaurline is dispersing an amino containing drug with AEROSIL® 200 under conditions of high shear. “The mixture was sheared on a high speed propeller mixer until a homogeneous gel was formed” column 6, line 6 and column 3, line 60. But the AEROSIL® 200 is not a colloidal, it becomes colloidal after processing in the formulation. Vrancken mixes in a small amount of AEROSIL® 200 into a formation that contains a high level of chalk, column 22, line 33. The quality of these dispersions and to what extent the silica has become “colloidal” is not clear. But there is no sol-gel chemistry in either Vrancken or Beaurline. Unlike Qi, there is no sol-gel chemistry to carry out that involves the condensation of trialkoxysilanes. Thus, the Examiners combination could not possibly yield Applicants invention.

In Chapter 4-Colloidal Silica-Concentrated Sols from The Chemistry of Silica by Iler, a lengthy discussion appears on the synthesis and stabilization of the dispersions based on Na₂O. Pages 319-323 derives ratios for the concentration of Na⁺ which can be calculated simply from the concentration of silica divided by the concentration of Na₂O. The top of page 331 states “To produce sols that are stable at a reasonably high concentration, it is necessary to grow the particles to a certain size under alkaline conditions where the particles remain negatively charged so they will not flocculate or gel.”

The specific chemistry of the AEROSIL particles is detailed in *Degussa Technical Bulletin Fine Particles Number 11, Basic Characteristics of AEROSIL® Fumed Silica*, as stated above. AEROSIL® is referred to by Degussa as fumed silica or pyrogenic silica, but never as colloidal silica. Both Vrancken, and Beaurline are incorrect to do so. In Section 3.6.3.4 entitled AEROSIL® on pages 44-46 states that AEROSIL® fumed silica is a very weak acid, i.e. the equilibrium in Figure 53 is shifted distinctly to the left. Figure 53 shows two silica particles with the surface chemistry



as they react with water. As the Degussa article states, this is a very unfavorable reaction for silica. And just as important is how the materials are made. Page 44, second column of the same reference states“ Moreover, it must also be considered with AEROSIL® fumed silica that due to the production process...slight amounts of hydrochloric acid strongly influence measurement of the pH value.” Thus AEROSIL®

silicas are acidic materials made in an acidic environment. Table 5 on page 9 of the same publication from Degussa reports the pH values of 3.6 to 4.3 for AEROSIL® as a class. Thus, Qi teaches an acid surface charge silica which is outside the scope of the claimed invention.

The chemistry for LUDOX® colloidal silica in the present invention is the opposite. In *Properties, Uses, Storage and Handling LUDOX® Colloidal Silica* by Du Pont, it is stated in page 2 that:” LUDOX® colloidal silica is an aqueous colloidal dispersion of silica particles. It is an opalescent liquid with a slight-to-moderate bluish cast;” and “They are dispersed in an alkaline media which reacts with the silica surface to produce a negative charge. Because of the negative charge, the particles repel one another resulting in a stable product.” Table I on page 3 shows the pH values of all negative charge LUDOX® colloidal silica are between 8.4-9.9, which are obviously basic colloidal silica. LUDOX® colloidal silicas are prepared in water by growing the particles in water under alkaline conditions. These particles are made by a precipitation in water using a strong base, generally sodium hydroxide. Working with the samples brings out one obvious difference immediately. While fumed silica is a white powder, colloidal silica is only obtainable as an aqueous sol. No milling is required to disperse the silica as taught by Qi. Removing the water results in irreversible gelation to form a monolith. If visible silica particles do form in the material, it is due to growth of the condensation of the colloidal silica into precipitated silica. The stability of the system increases with dilution. Particle size, temperature, and pH are all important factors.

This difference is of critical importance to the two materials formed by the different inventions. Both use base to catalyze the sol-gel reaction. Applicants use the non-volatile base Na₂O that is present on the surface of the colloidal silica. Qi uses 3-aminopropyltrimethoxysilane (See Examples in Qi). This makes for a very different material. In summary, the combination of Qi, Beaurline and Vrancken would not yield Applicants invention and this rejection should be removed.

Under section 13 of the Office Action, Claims 16, 17, 22-25 and 27-39 have been rejected under 35 USC § 102(e) as anticipated by or, in the alternative 35 USC § 103(a) as being obvious over Qi, as evidenced by Beaurline Vrancken and applicants’ admissions at page 40, lines 8-14 of the specification. Applicants respectfully traverse this rejection.

As with the rejection of claims 54, 55, 59-62, 64-73, 75-80 and 83-86, above, Qi does not teach or suggest the structure in Applicants' claims. Applicants' claims require a tertiary arylamine charge transport moiety (reference A) and a divalent bridging moiety (reference X). This is not shown in Qi. It is also not shown in Vrancken, Beaurline or Applicants' teaching of the silsesquioxane preparation shown on page 40. Thus this rejection does not provide all the elements for an anticipation rejection or an obviousness rejection. The Examiner states that the structure of Qi is similar to that shown on page 40 of the specification. However, the structure shown in the independent claims 16 of the present invention is distinct from formula IV-a of Qi. Thus, the Examiner has not made a proper rejection. Furthermore, Applicants have amended claim 16 to requires a basic surface charge colloidal silica. Both Vranken and Beaurline teach acidic silicas as does Qi. Thus, this rejection is not a proper prima facie rejection.

Under section 14 of the Office Action, Claims 54-62, 64-80 and 83-86 have been rejected under 35 USC § 103(a) as being unpatentable over Qi, as evidenced by Beaurline and Vrancken, combined with (5,427,880) Tamura, as evidenced by Diamond, Handbook of Imaging Materials, p. 426 and Fig. 9.22 at page 430 (Diamond) and US 6,376,695 B1 (Kushibiki).

As admitted by the Examiner, Qi does not exemplify Applicants polymer obtained from DAAS. The Examiner states that Qi does not limit the type of vinyl-containing monomer comprising a hole transporting moiety. However as claimed in the present invention the hole transporting moiety is attached to a divalent bridging moiety. This is not taught or suggested by Qi. Tamura is cited to show the monomer di-p-anisylamino styrene. The Examiner then states that it would have been obvious for a person having ordinary skill in the art to replace the vinylcarbazole monomer with the di-p-anisylamino styrene and to use the resultant polymer to form the overcoat layer in the imaging layer of Qi. This is hindsight reconstruction as it ignores the teachings of both Qi and Tamura. Tamura teaches that the di-p-anisylamino styrene is polymerized with a binder resin. The binder resins are disclosed in Formula IV (col 29) and Formula V (col. 30) in Tamura. These resins are not silsesquioxanes and therefore Tamura teaches away from using the di-p-anisylamino styrene with silsesquioxanes as they are vinyl polymers. Further Qi teaches away from the present invention in that the transport material is bonded to the

polymer backbone through a nitrogen bond. In the Examples and claims of Qi, the only hole transport moiety is vinyl carbazole. There is never any teaching that a different hole transport moiety would be effective.

As discussed above the silicas of Vrancken, Beaurline and Qi are all acidic surfaces that are neutral in charge. The present invention limits the silica to a basic surface charge, where the negative charge on the silica surface causes the sol to be stable due to electrostatic repulsion. Thus, the combination proposed by the Examiner could not yield Applicants' invention.

Moreover, this polymer is formed into a layer through reaction with an organo silane compound in a mixture of ethanol/water and silica particles. Amended Claim 54 requires that the polymer be reacted with 5 to 30 weight percent of basic surface charge colloidal silica based on the weight of the silsesquioxane. This silica is distinguishable from the silica particles of Qi in that the silica is basic surface charged. The surface of the silica particles are negative so that they repel each other to form a stable sol. The AEROSIL™ 200 silica used by Qi is a fumed silica made by pyrolysis. The pH of the AEROSIL™ 200 particles are all about 4. A pH of 4 will not catalyze the sol-gel condensation reaction (curing).

Moreover, fumed silica would not function to cure the sol-gel as it does not carry with it the basic charge carriers (Na_2O) that basic surface charge colloidal silica has associated with it. The Qi silica is not a catalyst for the sol-gel condensation reaction. In Applicants' invention, the combination of acetic acid and sodium oxide on the colloidal silica is the catalyst. Acetic acid reacts with the sodium oxide (or sodium hydroxide) to form sodium acetate. On drying at 80 °C, the equilibrium is reversed. Acidic acid volatilizes as it is formed, pushing the equilibrium all the way back and leaving only the non-volatile sodium oxide of the colloidal silica. The siloxane condensation reaction is base catalyzed, resulting in a much higher degree of condensation of the silsesquioxane. Thus, the combination cited by the Examiner would not yield Applicants' invention.

Under section 15 of the Office Action, Claims 56-62, 64-80 and 83-86 have been rejected under 35 USC § 103(a) as being unpatentable over Qi, as evidenced by Beaurline and Vrancken, combined with Tamura, as evidenced by Diamond, Handbook of Imaging Materials, p. 426 and Fig. 9.22 at page 430 (Diamond) and US 6,376,695 B1 (Kushibiki). As mentioned above Qi and Tamura

describe different polymerization reactions, Qi, a condensation reaction and Tamura a vinyl addition reaction. Thus, the Examiner is picking and choosing different elements from the references without regard to the underlying teaching. Further Qi does not teach the polymer being reacted with basic surface charge colloidal silica based on the weight of the silsesquioxane. In addition the silica taught by Vranken, Beaurline and Qi is different from the silica claimed in the present invention. So, if one combined the references as suggested by the Examiner, the result would not be the silsesquioxane claimed in the present invention. Since the combination cited by the Examiner does not make out a prima facie case of obviousness, the rejection should be removed.

Claims 16-25 and 27-39 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Qi, as evidenced by Beaurline and Vranken, and Applicants' admissions I, combined with Tamura, as evidenced by Diamond and Kushibiki. The rejection is traversed. It is the conclusion of the Examiner that "It would have been obvious for a person having ordinary skill in the art, in view of the teachings of Qi and Tamura, to replace the vinylcarbazole monomer with the Tamura di-p-anisylamino styrene as the monomer comprising a hole transporting moiety in the Qi silyl-functionalized hydroxyalkyl polymer of Formula (IV-a) and to use the resultant polymer to form the overcoat layer in the imaging member disclosed by Qi. That person would have had a reasonable expectation of successfully obtaining an crosslinked composite polysiloxane-silica that has excellent adhesion to a charge transport layer as disclosed by Qi and improved charge transporting characteristics as disclosed by Tamura; and an electrophotographic imaging member having the benefits disclosed by Qi and Tamura."

As noted above, the combination of Qi with Beaurline and Vranken would not yield the polymer of Applicants invention. Further, Tamura although mentioning di-p-amino styrene as a hole transport moiety uses a binder resin as the polymer backbone. This binder resin can have three classes of hole transport moieties attached. However, not all the classes mentioned by Tamura contain a divalent bridging moiety as required in the present invention. Thus, the Examiner has reconstructed the present invention by selected a compound from Tamura to combine with Qi. This reconstruction ignores the teaching of the polymer backbone of Tamura.

Claims 16-25 and 27-39 have been rejected under 35 USC § 103 as being unpatentable over Qi, as evidenced by Beaurline and Vranken and Applicants' admissions I, combined with Tamura, as evidenced by Diamond and Kushibiki. The remarks in the previous rejection are applicable here and this rejection should be removed.

For at least the reasons set forth above, Applicants submit all of Claims 16-25, 27-39, 54-62 and 64-86 remain in the present application are in condition for allowance. Prompt and favorable action is respectfully requested.

Should the Examiner require anything further, or have any questions, the Examiner is asked to contact Applicants' undersigned representative.

Respectfully submitted,



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